

Nuclear Energy in India: Debate and Public perception

By Manasi Mahanty,

Post-Doctoral Fellow, Dept. of Political Science,
University of Hyderabad.

E-mail: manashi. mohanty0S@gmail.com,

mobile--91 943751 1 501

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Around the world, a number of countries are investing in or considering building new nuclear plants. In other words, there is currently an international drive to build new nuclear plants, bringing about what is being termed a "nuclear renaissance" (Goodfellow, Williams and Azapagic 2011). The main drivers for this renaissance include climate change, effort to combat greenhouse gas emission, an impending electricity generation gap and security of fossil fuel supply. However, the public perception of nuclear energy has historically been, and continues to be a key issue, particularly in the light of the Fukushima nuclear incident. Public perception of nuclear power has been an active research topic for decades, with numerous studies reporting on the level of public support for, or opposition to, nuclear power (Eurobarometer, 2010; Poortinga et al., 2005). Investigations into the underlying psychological (Fischhoff et al., 1978; Slovic, 1987) and sociological (Douglas and Wildavsky, 1982; Wildavsky and Dake, 1990) factors that govern these attitudes have also been carried out.

The recent events at the Fukushima Daiichi nuclear plant in Japan have resulted in a renewed focus on understanding both the safety of nuclear power and the public understanding and level of acceptance of nuclear power. Many countries such as Korea, Taiwan, India, China, Finland, Germany and Sweden confront similar public acceptance issues when they try to expand or restart their nuclear power plant operations. Negative public attitude toward nuclear power has often had far-reaching consequences for the nuclear industry. For instance, the previous and recent proposals for construction of new nuclear power plants in India led to significant public resistance. It is important to understand why people oppose nuclear power plants. It is also necessary to address the apprehensions of people in a more informed and sensitive manner.

This paper focuses on new nuclear build, using the Indian experience for study. First of all, it tries to analyze the disparity between perceived and calculated risks from nuclear power plants in India and to explore the existing knowledge on both these risks could be integrated within a nuclear policy framework. Such a policy framework can provide a socially informed

approach which could be helpful in addressing social, economic and environmental concerns about nuclear power plants. Moreover, to understand better some of the concerns related to new nuclear plants, it is important to address the experiences of the previous nuclear plants.

Risk Assessment

Most people conceive of risk as multi-dimensional, encompassing several characteristics of the hazard - such as its catastrophic potential, its controllability, and its threat to future generations. Technical analysts have a narrow conception of risk, viewing calculated risk as a mathematical product of the likelihood of an adverse occurrence, and the consequence of that occurrence. The calculated risk represents an attempt to define risk 'objectively' using various mathematical approaches while the perceived risk tries to account for subjective factors of psychological and sociological nature. To quantify risks at complex systems such as nuclear power plants, analysts rely on a mathematical method known as Probabilistic Risk Assessment. Theoretically, the probabilistic risk assessment method suffers from a number of problems. Such risk assessments cannot account for the indirect, non-linear, and feedback relationships that characterize many accidents in complex systems. These risk assessments do a poor job of modelling human actions and of anticipating accidents in which a single event, such as a tsunami, causes failures in multiple safety systems. The risks that seaside reactors like Fukushima and Madras Power Station of India face from natural disasters in 2011 and 2004 respectively are well known. Therefore any calculation using this methodology is always uncertain as to the accuracy and completeness of the methods used, especially accident. However, the public is concerned about perceived risks which have no sound scientific basis and almost certainly do not exist. There is a need to discuss this dilemma in the context of nuclear power plant projects in India. A great deal of research is necessary to understand public perception of nuclear power in India because the controversy of nuclear power has been present since the inception of technology.

Economics

The economics of new nuclear power plants is a controversial subject, since there are diverging views on this topic, and multi-billion dollar investments ride on the choice of an energy source. Nuclear power plants typically have high capital costs for building the plant. Therefore, comparison with other power generation methods is strongly dependent on assumptions about construction timescales and capital financing for nuclear plants. Cost estimates also need to take into account plant decommissioning and nuclear waste storage costs. However, nuclear has lower fuel costs but higher operating and maintenance costs. The radiation exposure affected the workers of Kaiga and Kakrapur nuclear power plants in 2009 and 2011 respectively. Thus security costs of both protecting the physical plant and the

screening of workers must be considered. Since nuclear reactors contain a core of highly radioactive fuel and around that core a complex cooling system which is also significantly contaminated, nuclear power plant operators need to invest considerable resources in keeping these structures intact, functioning, and isolated from the environment is precisely the most costly maintenance strategy and design. The costs of preventing nuclear proliferation and terrorism should be recognized as negative externalities of civilian nuclear power, thoroughly evaluated, and integrated into economic assessments. The nuclear plant licensing process is also a key to new nuclear plant. This process, involves an in-depth-justification of the safety of the nuclear plant to satisfy regulatory bodies. This paper provides a critical evaluation of the economics of new nuclear power plants in India.

Public Policy Making

One of the key driving factors for new nuclear power plants is the Indian government's commitment to reduce national carbon emissions in an effort to address climate change. India has signed the Kyoto protocol which implies that it shares the concern of global warming and is committed to slow down climate change. Besides, the Government is confronted with the challenge of producing enough electricity and distributing at a cheap price to meet the increasing demand of a fast growing economy. Such increase in production of electricity has to be achieved with efficient use of new technology; use of non conventional energy sources to reduce the harmful emission; and adoption of new energy saving devices .These arguments are advanced by policy makers, scientists and technologists with corporate sector to justify the construction of new nuclear power projects in India .These arguments, however , have been challenged and subjected to critical scrutiny by dissenting political forces, intellectuals and peoples' movement. The Left parties and leaders in India made a difference in the nuclear issue. They argue that American, Russian and French capitalists try to dumb their nuclear technology on India for their own survival and profit. They also argue that mining and processing of uranium, building nuclear power stations with so much cement and steel, the long construction process, the decommissioning of the plants , and handling the radioactive waste cause considerable climate-changing pollution.

Due to personal alliances of political elite and industrial and bureaucratic vested interests, projects are initiated without due consideration to the public policy goals but to obtain deeper penetration into the financial resources of the government. Secrecy and non-accountability of the Atomic Energy program offer the maximum possible scope for extra -constitutional dealings of the sub-government whose constitutional validity has been sanctioned under the DAE Act 1962. The policy-makers are warned to consider seriously the nuclear experience

of the world and take into account social, economic, industrial, and ecological implications before committing ourselves to nuclear energy. The debate on nuclear energy requires careful and thorough examination. Most policies are conceived and executed without the knowledge of the people. Here both economic and political considerations are involved in the continuing competition between indigenous and foreign technology, in the relationship of public and private sectors, and in the relative roles to be played by small, medium and large scale industry. My paper seeks to address these issues regarding policy with a constructive argument that policy makers must recognize the importance of public perception on nuclear power as a significant factor within global nuclear build.

Peoples Resistance

Following the Fukushima nuclear disaster, India, another potential nuclear boom market, has encountered effective local opposition, growing national wariness about foreign nuclear reactors, and a nuclear liability controversy that threatens to prevent new reactor imports. There have been mass protests against the French-backed 9900 MW Jaitapur Nuclear Power Project in Maharashtra and the 2000 MW Koodankulam Nuclear Power Plant in Tamil Nadu. The state government of West Bengal has also refused permission to a proposed 6000 MW facility near the town of Haripur that intended to host six Russian reactors. From the early legitimate fears around displacement and relocation, the struggle has moved into the post-Fukushima phase where serious and well researched concerns about safety of nuclear plants in general as well as the inbuilt dangers of nuclear technology itself are being raised with a level of confidence as an assertion of the recent situation. The struggle in Koodanakulam and Jaitapur stands out for the sustained participation of large numbers of women against these nuclear projects.

The public perceives nuclear power as a very risky technology. The radioactive waste at both the sites of uranium mining sector and nuclear plant contaminate land, air, water and food products. It badly affects our ecosystem which leads to epidemics of cancer, leukaemia, and genetic diseases. In some cases, association with nuclear facilities is even subject to stigma. Public resistance to nuclear power is likely to continue, making it difficult to site and build new reactors. This resistance may be a major obstacle to the rapid expansion of nuclear power. People living close to nuclear plants are much more realistic about risk and uncertainty than the industry and regulatory authorities seem to realise. Communications based on the assumption that the public is seeking "zero risk" are misguided, and undermining the credibility of the institutions involved (Wynne et al., 2007). The proposed project is facing stiff resistance from the local population, several political parties and

activists who want it scrapped after the radiation leak at Fukushima nuclear plant after the Tsunami in March 2011. It is important to address these issues in a more effective manner.

This paper provides deeper and subtler trends of public perception among communities that are close to nuclear plants. The paper tries to focus how the government designs nuclear policy with a view to gaining public acceptance. It makes estimates of cost and benefit for constructing nuclear facilities and persuading the public to accept it. It is necessary to ascertain how different social groups of a locality perceive the risk and opportunity of nuclear plants. The media plays an important role in shaping public action by disseminating information regarding such power plants and news about people's resistance. Therefore, an analysis of the role of media could contribute a part of this project.

This paper suggests on better mechanisms for ensuring critical and relevant science, technology and economic issues in national policy decision making. A very few persons are willing or able. to contribute effectively to national policy debate on energy, technological and environmental issues. This is a significant factor which exists between science, the public and the policy makers. The science community needs to be more effective in public and political debates on national policy decisions involving high technology issues relating nuclear power plants in India.

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